FIG. 1

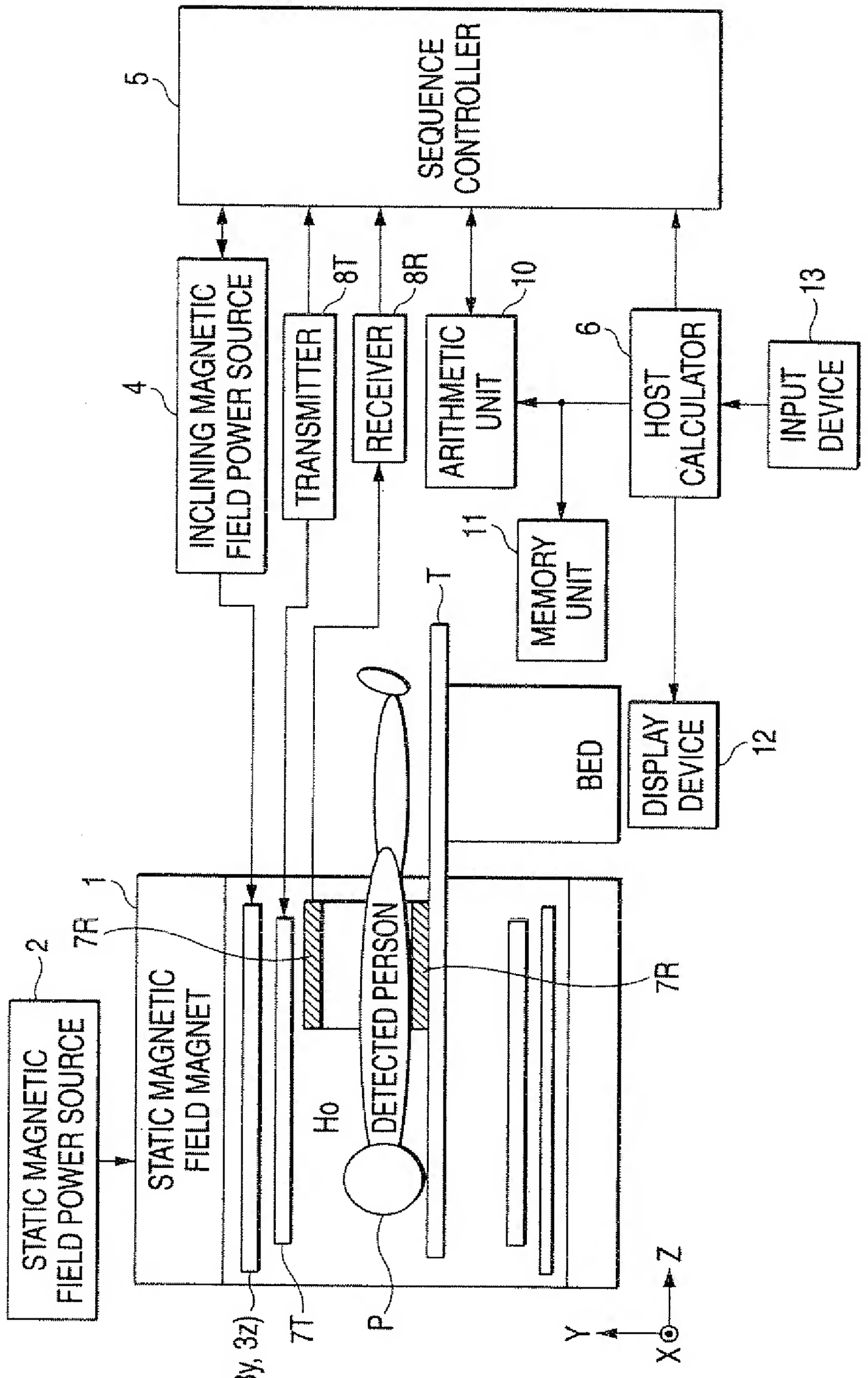

SEQUENCE CONTROLLER
5
INCLINING MAGNETIC FIELD POWER SOURCE
4
TRANSMITTER
8T
RECEIVER
8R
ARITHMETIC UNIT
10
HOST CALCULATOR
6
INPUT DEVICE
13
MEMORY UNIT
11
BED
DISPLAY DEVICE
12
T
1
STATIC MAGNETIC FIELD POWER SOURCE
2
STATIC MAGNETIC FIELD MAGNET
7R
7T
3 (3x, 3y, 3z)
H0
DETECTED PERSON
P
Z
Y
X

*FIG. 2*

CHARACTERISTICS OF MOTION
IN ABDOMINAL MR IMAGE

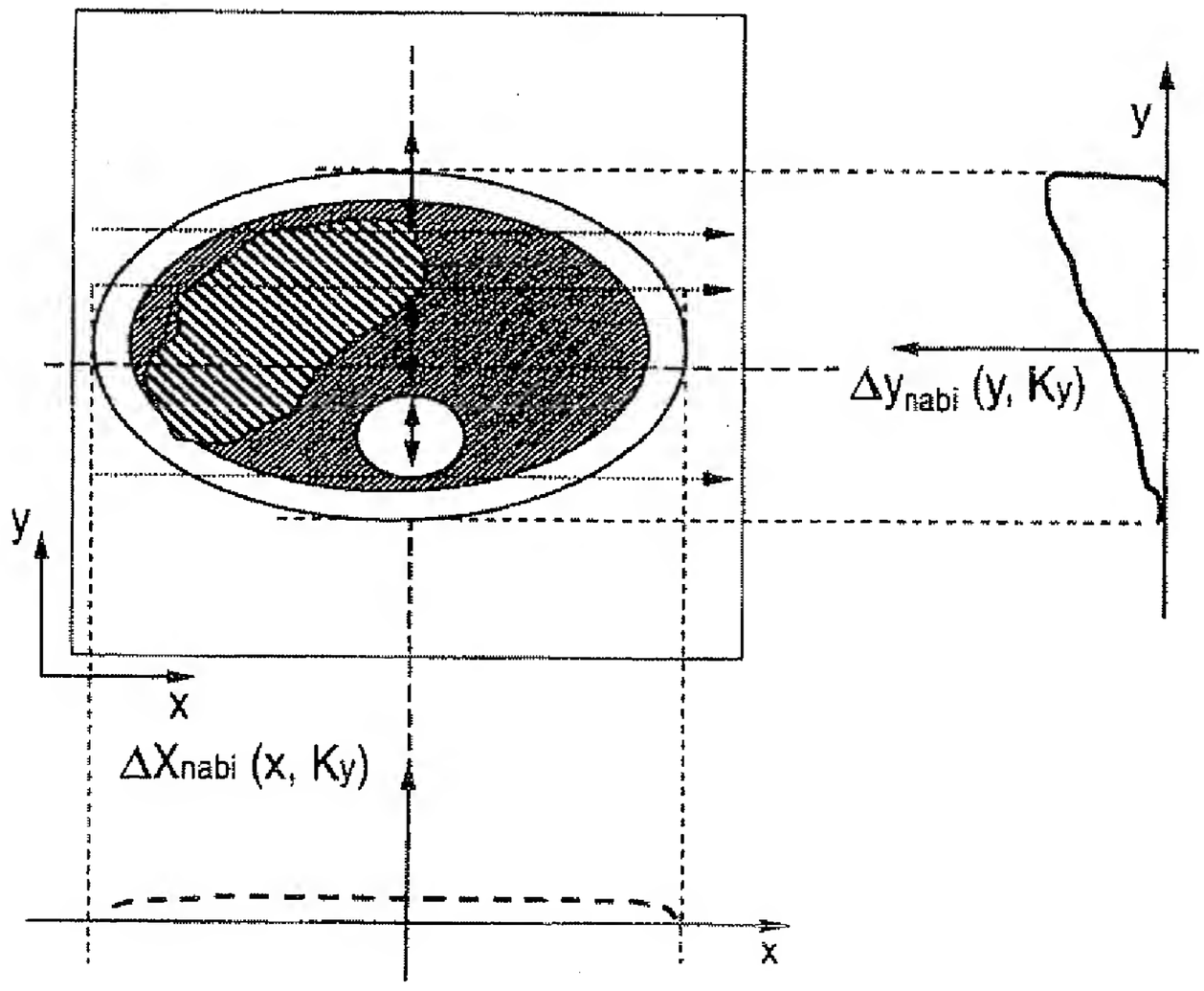


FIG. 3

PULSE SEQUENCE FOR SPIN WARP AND NAVIGATOR ECHO-#1
(IMAGING: R0: x, 1D LINE BY LINE PHASE MEASUREMENT
MODE OF MOVING IN y DIRECTION)

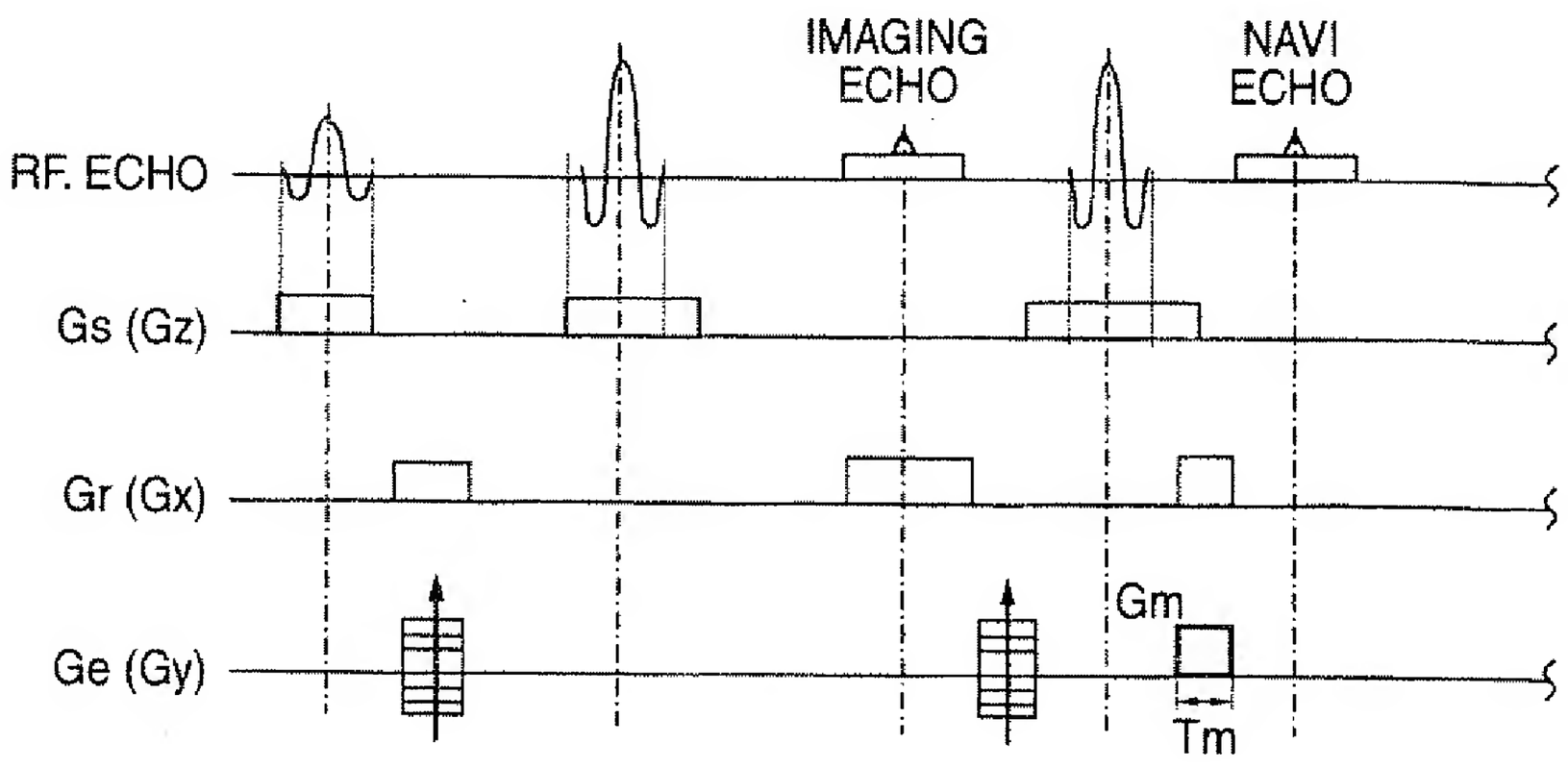
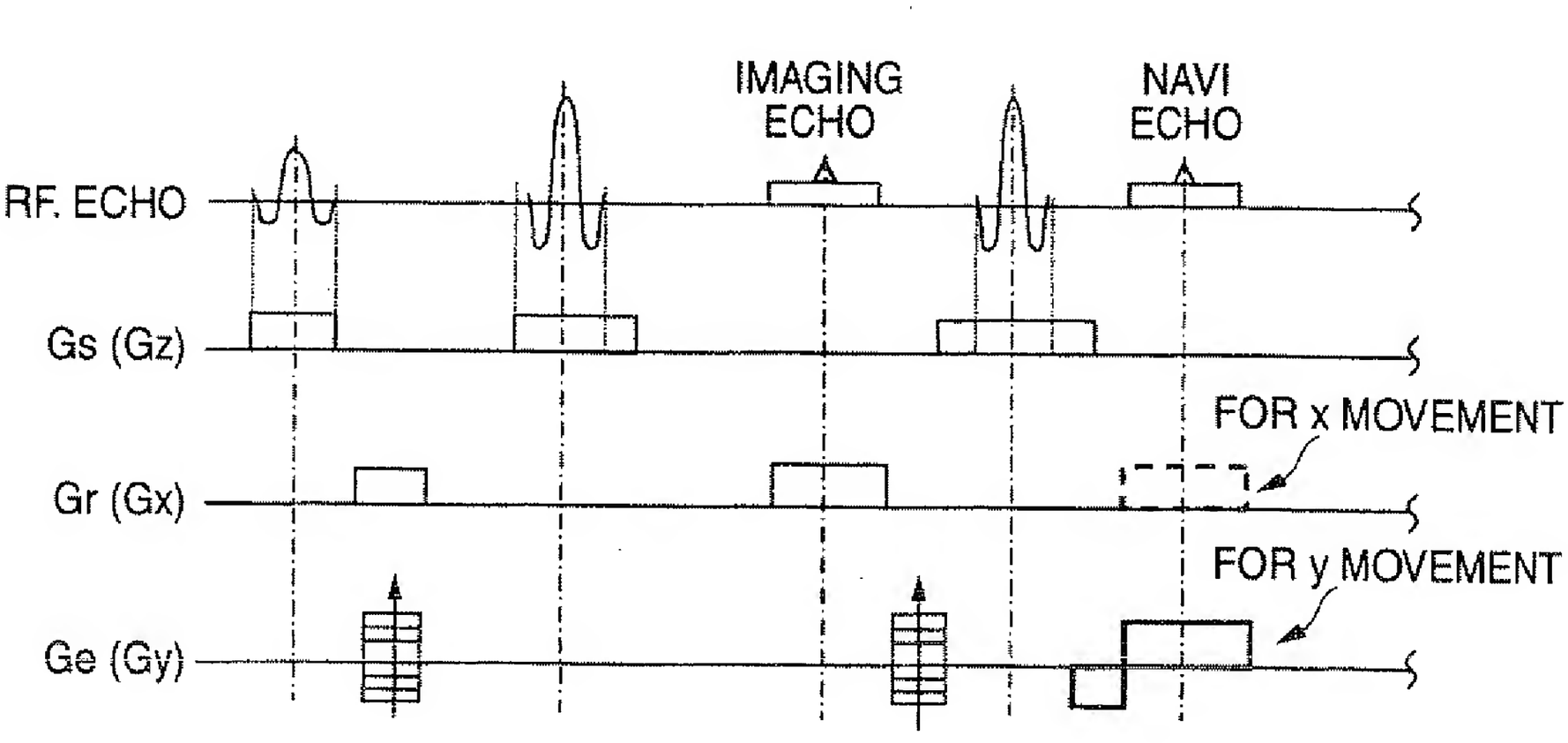



FIG. 4

PULSE SEQUENCE FOR SPIN WARP AND NAVIGATOR ECHO-#2
(IMAGING: R0: x, 0'TH ORDER PHASE MEASUREMENT
OF MOVING IN y DIRECTION)



# FIG. 5

PROCESSING FLOW DIAGRAM OF NONLINEAR MOTION CORRECTION USING 1D NAVIGATOR ECHO (CASE USING SINGLE COIL)

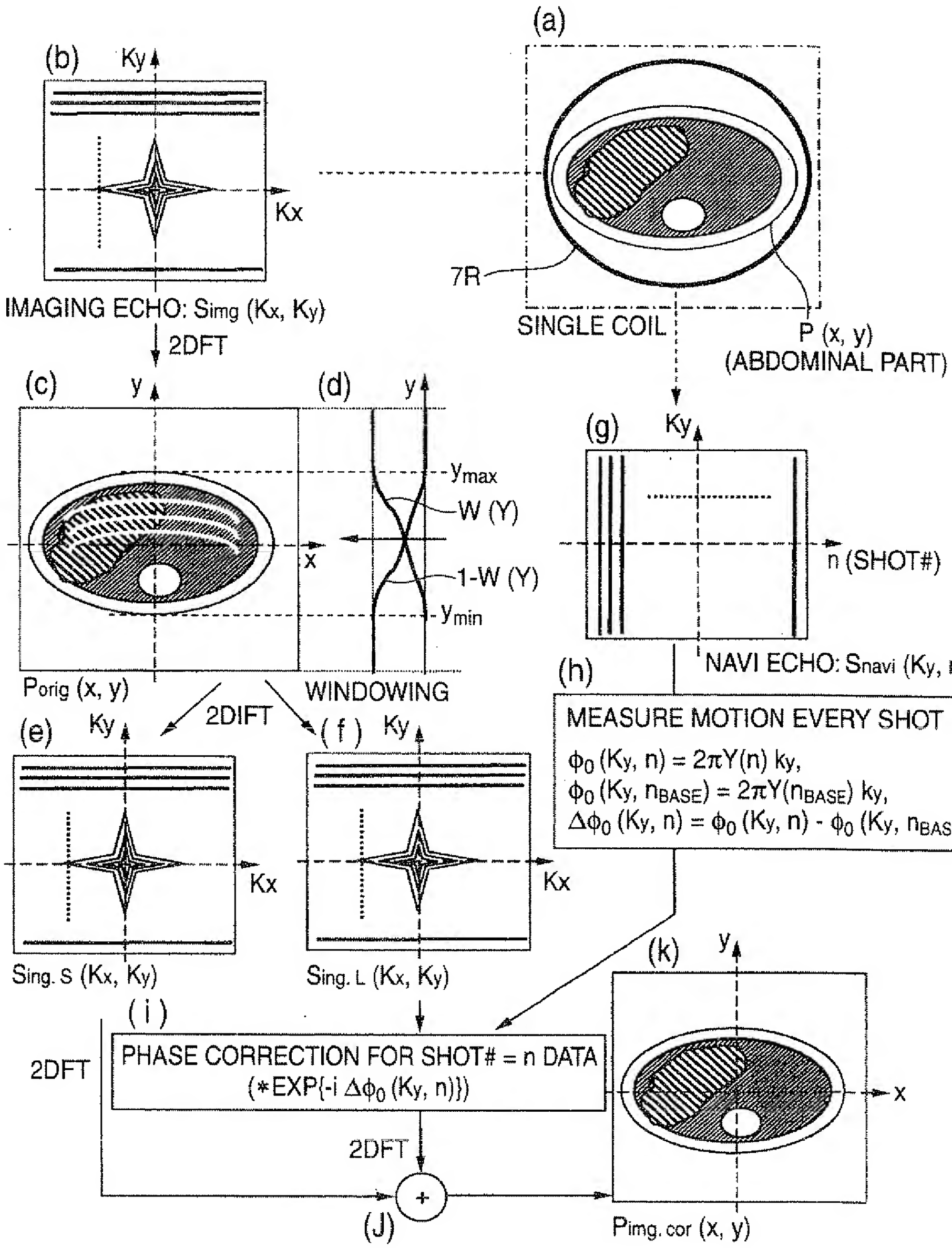
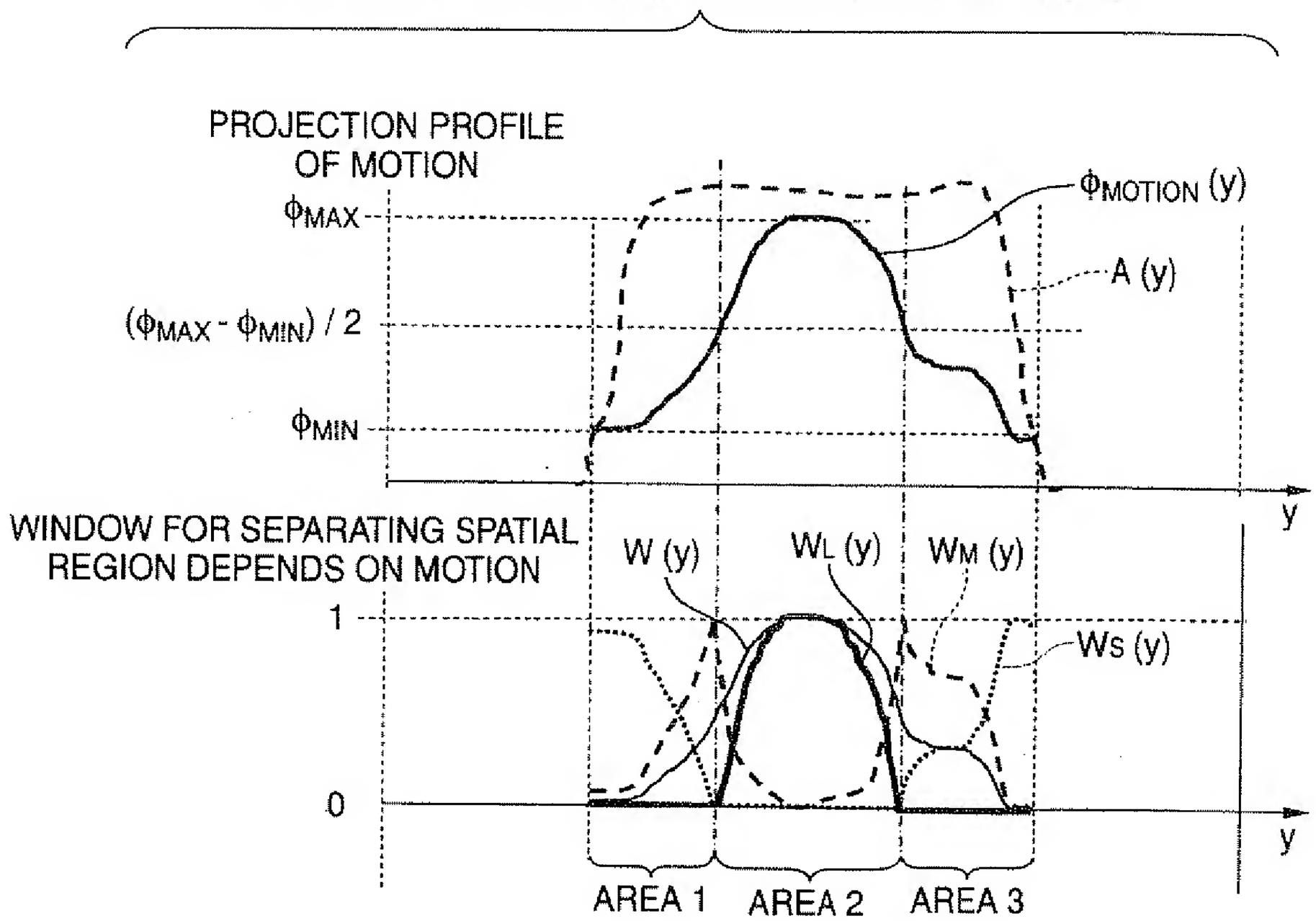


*FIG. 6*

WINDOW EXAMPLE OF THREE DIVISIONS OF SPATIAL REGION IN PROJECTION PROFILE MEASURING MODE



# FIG. 7

PROCESSING FLOW DIAGRAM OF NONLINEAR MOTION CORRECTION USING 1D NAVIGATOR ECHO (PROCESSING FLOW OF CASE USING MULTICOIL)

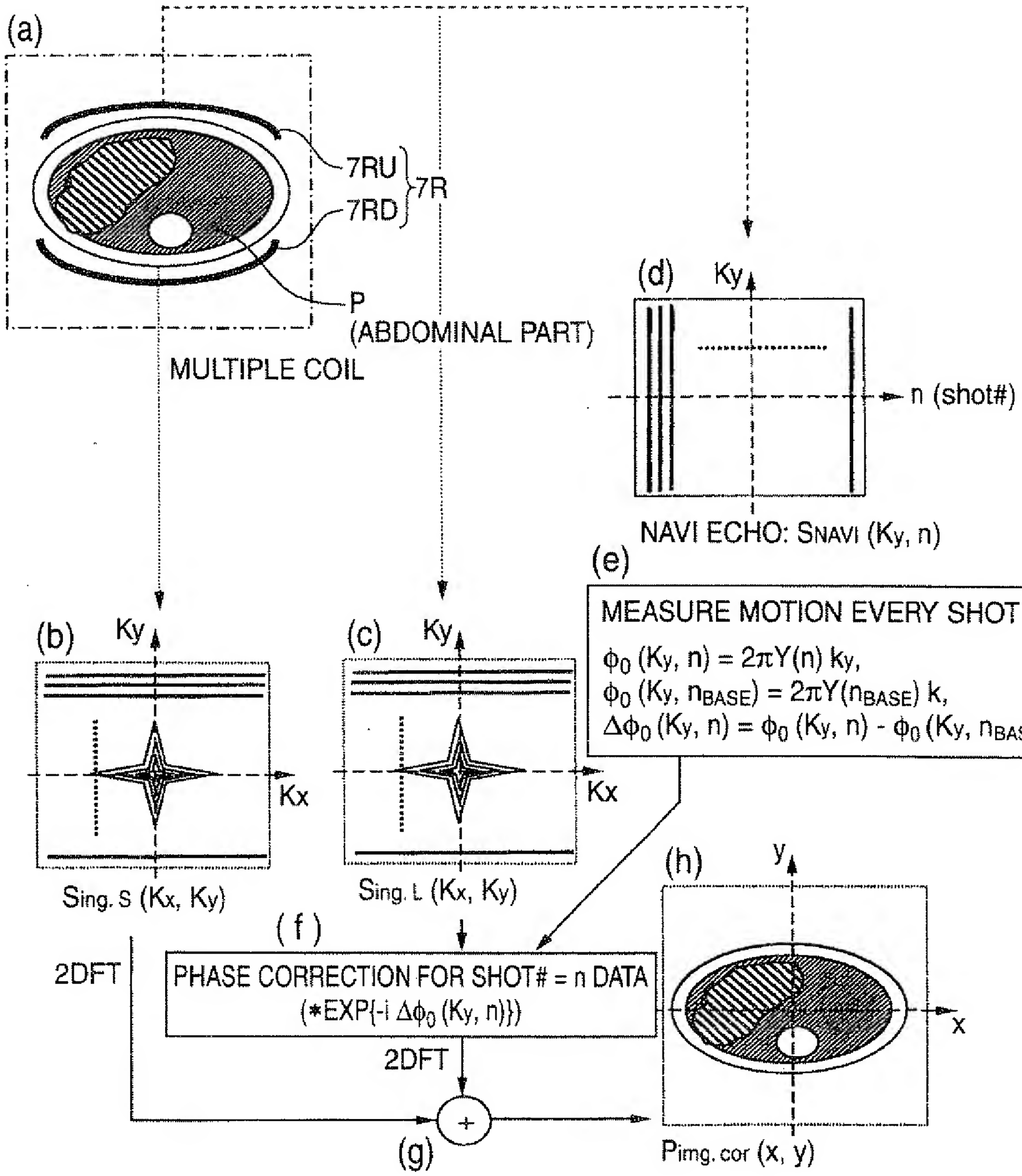


FIG. 8

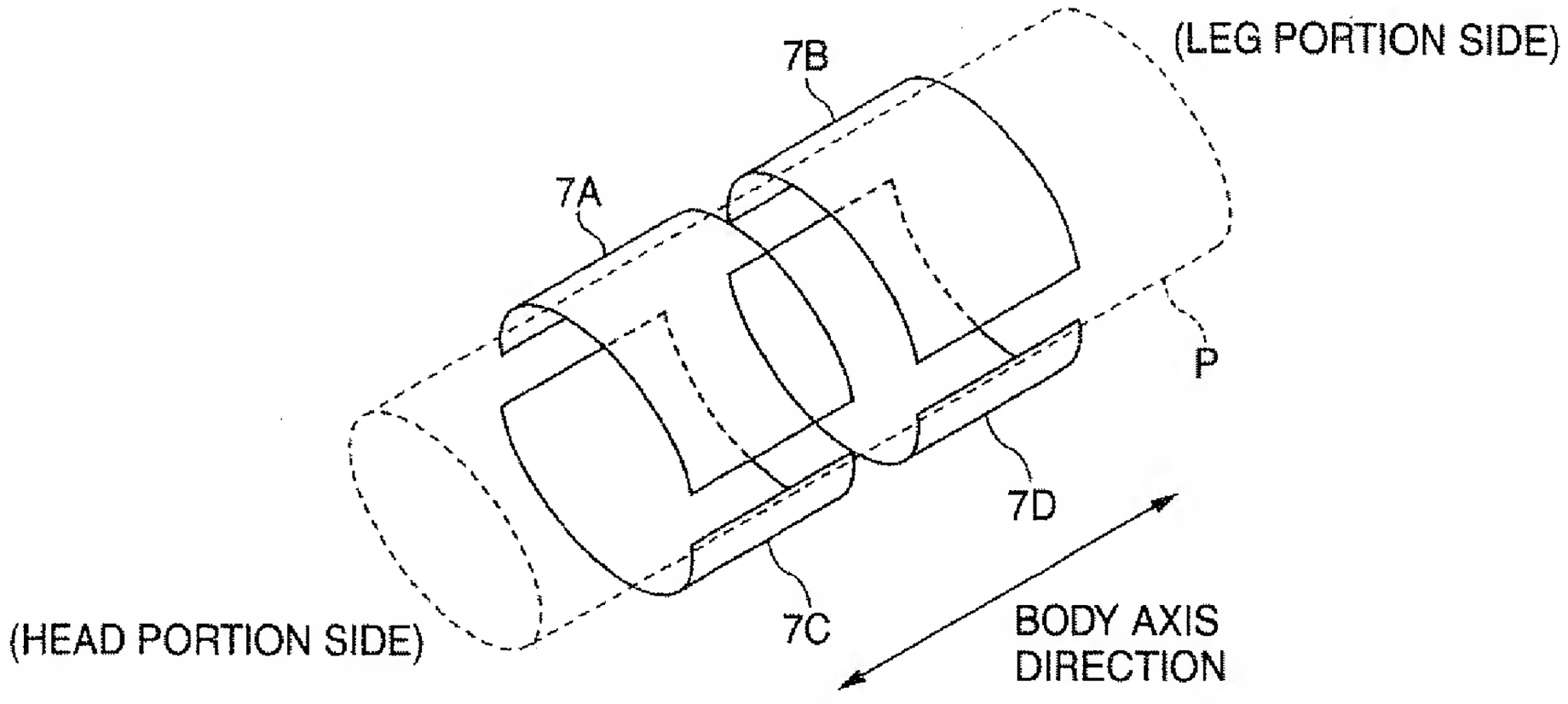

7B
(LEG PORTION SIDE)
7A
P
7D
7C
(HEAD PORTION SIDE)
BODY AXIS
DIRECTION

FIG. 9

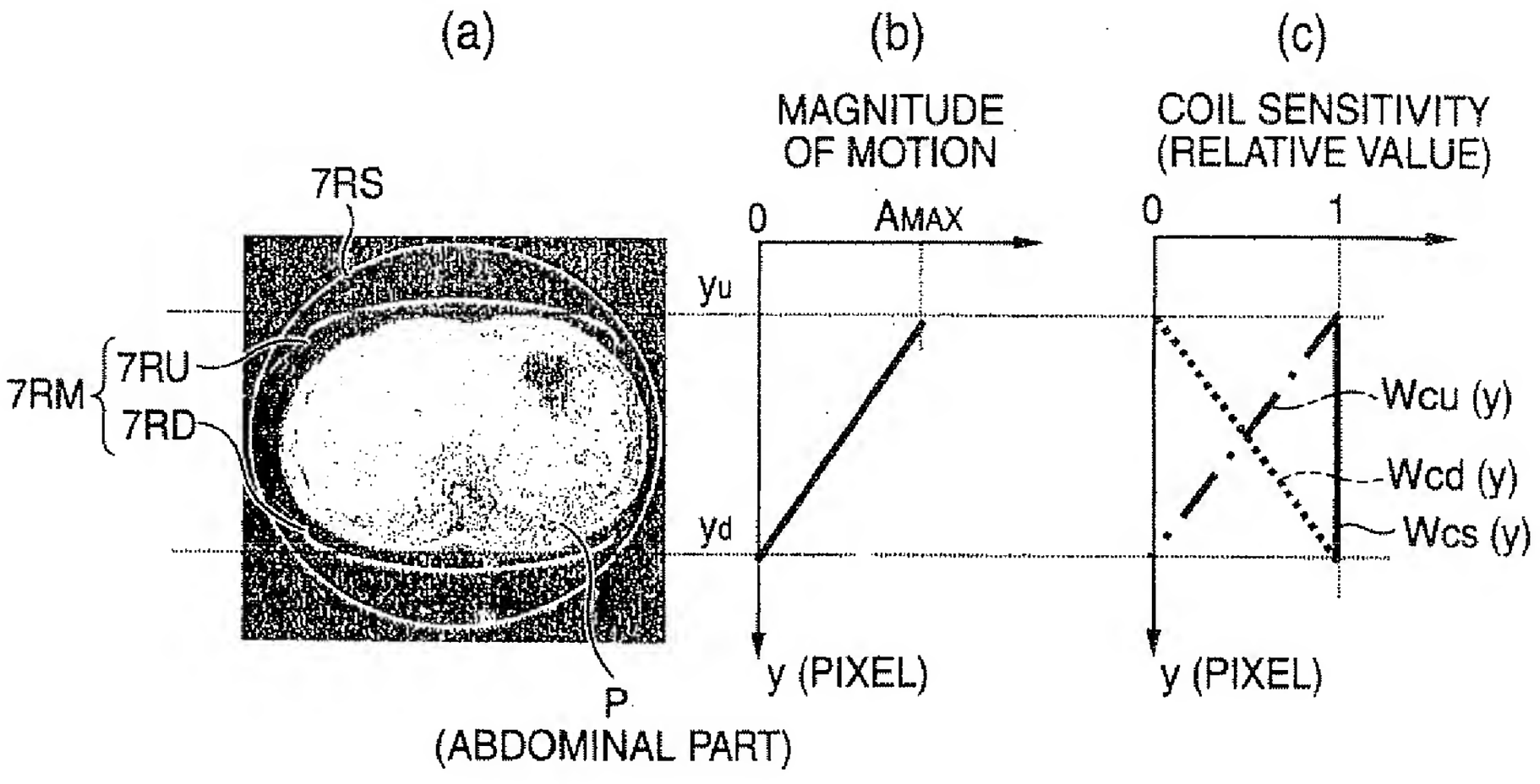

(a)
(b)
(c)
7RS
7RM
7RU
7RD
P
(ABDOMINAL PART)
MAGNITUDE OF MOTION
0
AMAX
yu
yd
y (PIXEL)
COIL SENSITIVITY (RELATIVE VALUE)
0
1
Wcu (y)
Wcd (y)
Wcs (y)
y (PIXEL)

FIG. 10

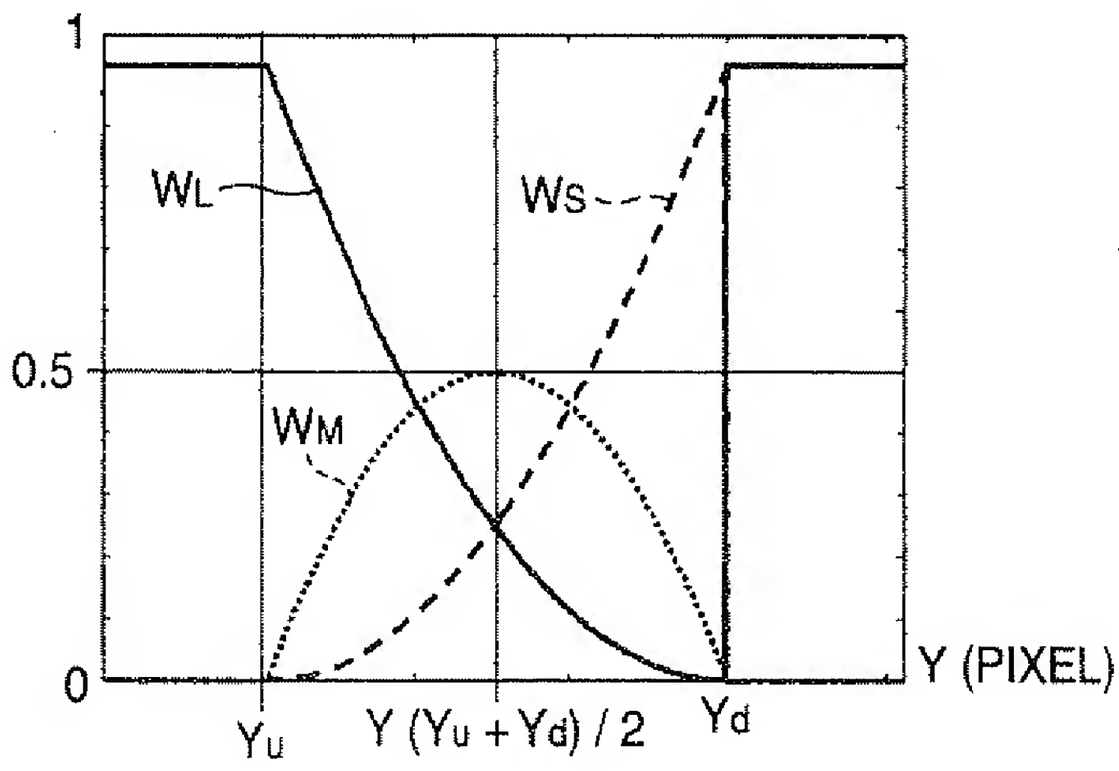
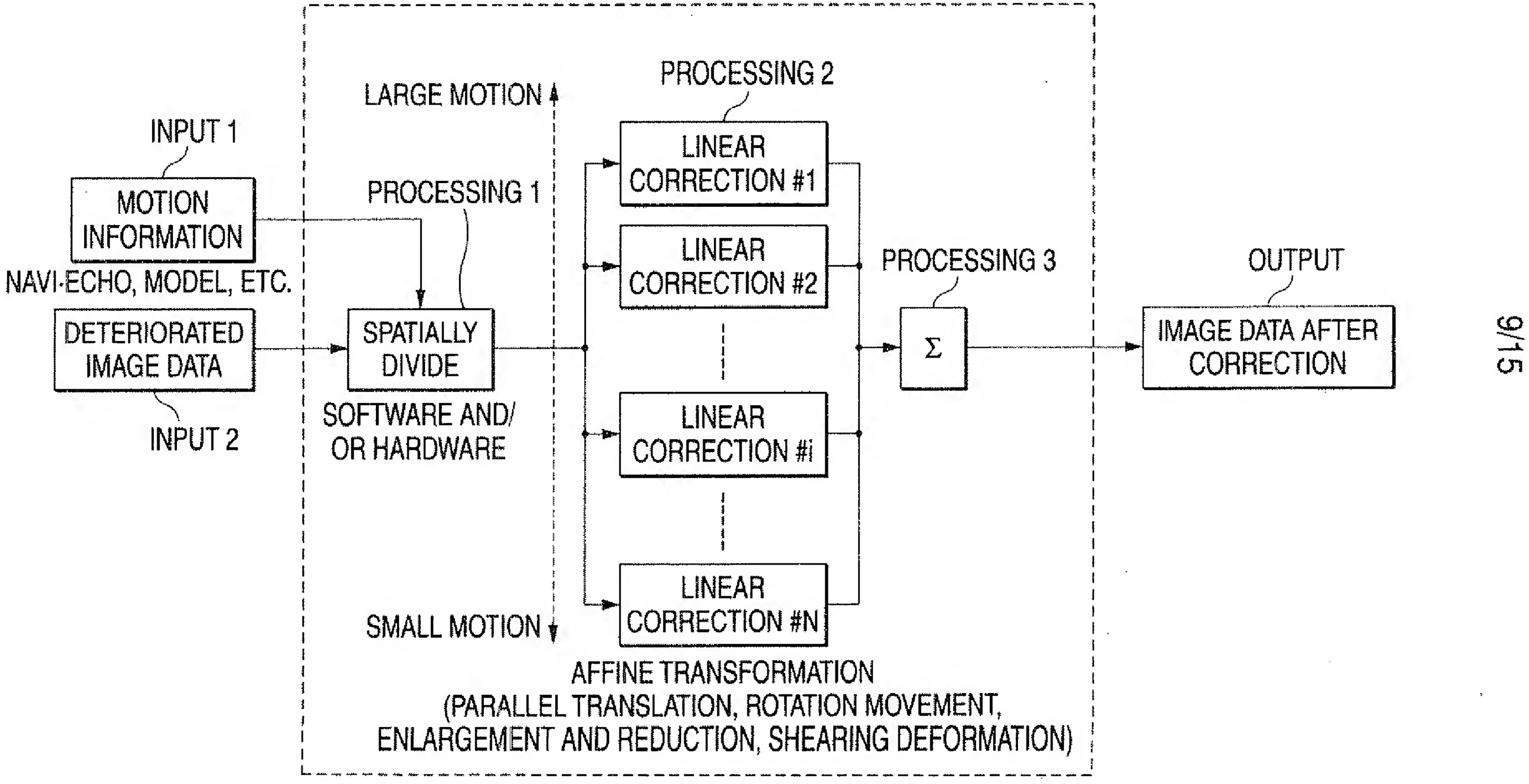

1
0.5
0
WL
WS
WM
Yu
Y (Yu + Yd) / 2
Yd
Y (PIXEL)

FIG. 11


INPUT 1
MOTION INFORMATION
NAVI·ECHO, MODEL, ETC.
DETERIORATED IMAGE DATA
INPUT 2
LARGE MOTION
PROCESSING 1
SPATIALLY DIVIDE
SOFTWARE AND/ OR HARDWARE
PROCESSING 2
LINEAR CORRECTION #1
LINEAR CORRECTION #2
LINEAR CORRECTION #i
LINEAR CORRECTION #N
SMALL MOTION
PROCESSING 3
Σ
OUTPUT
IMAGE DATA AFTER CORRECTION
AFFINE TRANSFORMATION
(PARALLEL TRANSLATION, ROTATION MOVEMENT,
ENLARGEMENT AND REDUCTION, SHEARING DEFORMATION)

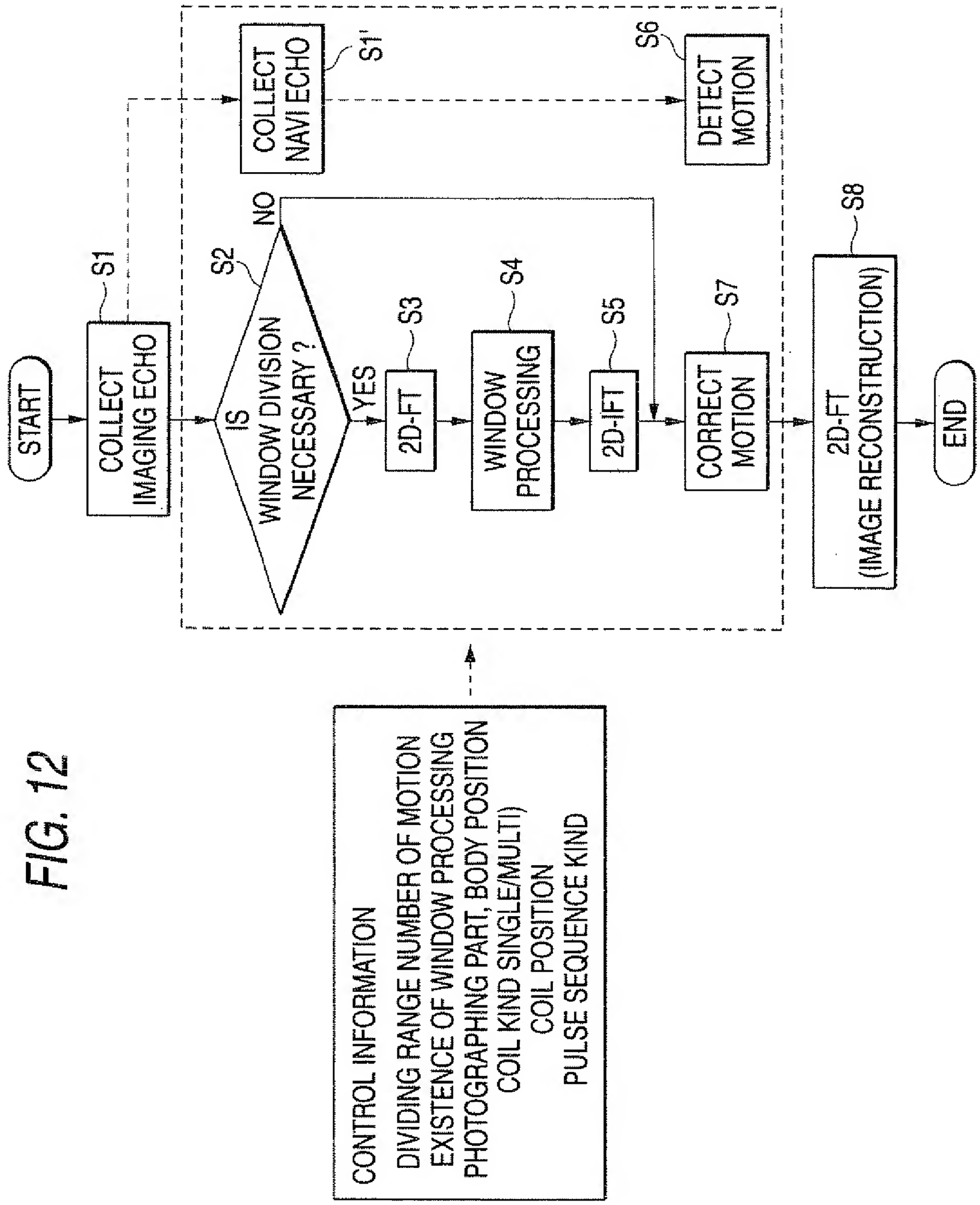

START
COLLECT IMAGING ECHO
S1
IS WINDOW DIVISION NECESSARY ?
S2
NO
YES
2D-FT
S3
WINDOW PROCESSING
S4
2D-IFT
S5
COLLECT NAVI ECHO
S1'
DETECT MOTION
S6
CORRECT MOTION
S7
2D-FT (IMAGE RECONSTRUCTION)
S8
END
CONTROL INFORMATION
DIVIDING RANGE NUMBER OF MOTION
EXISTENCE OF WINDOW PROCESSING
PHOTOGRAPHING PART, BODY POSITION
COIL KIND SINGLE/MULTI)
COIL POSITION
PULSE SEQUENCE KIND

FIG. 12

FIG. 13

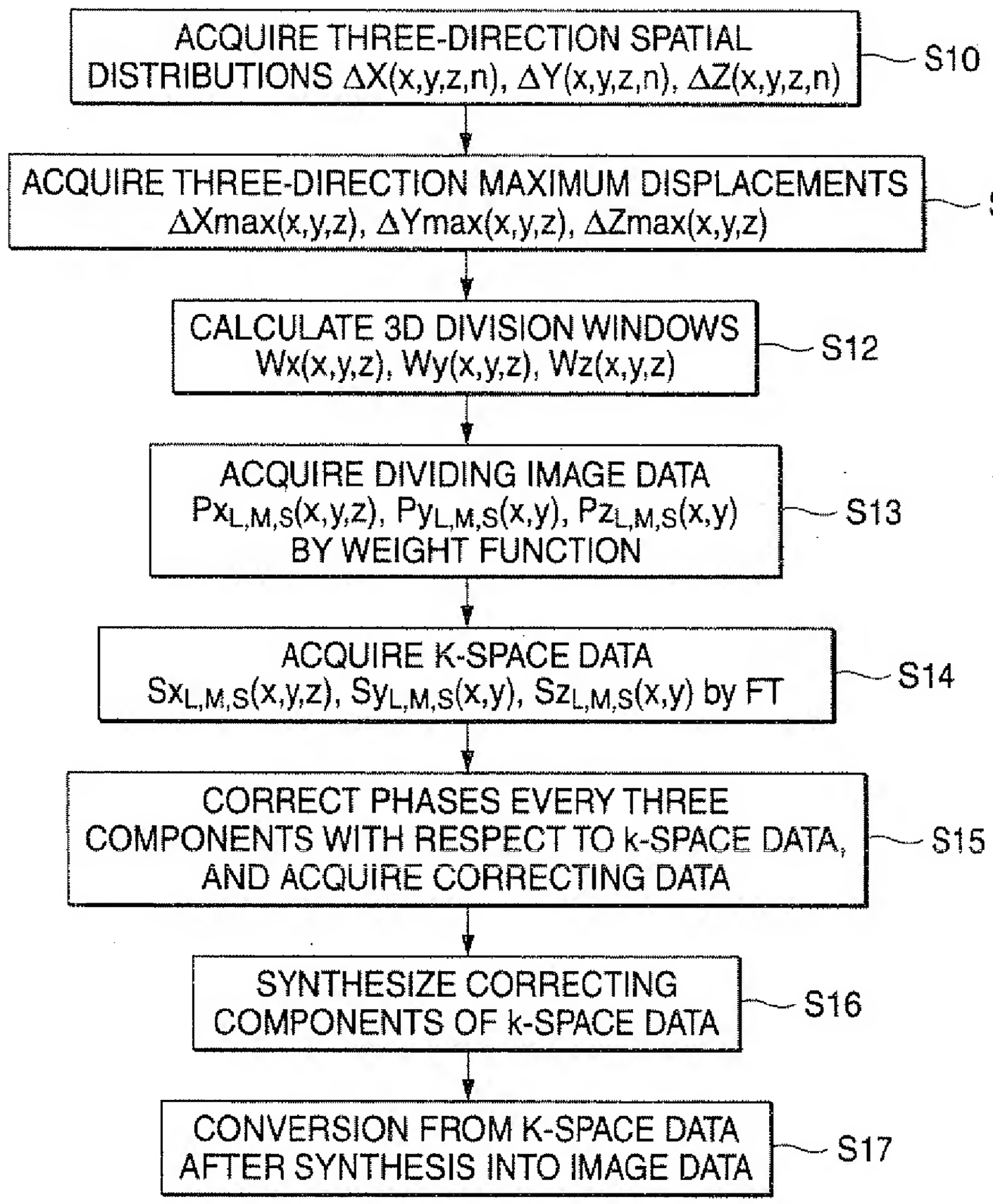

ACQUIRE THREE-DIRECTION SPATIAL DISTRIBUTIONS ΔX(x,y,z,n), ΔY(x,y,z,n), ΔZ(x,y,z,n)
S10
ACQUIRE THREE-DIRECTION MAXIMUM DISPLACEMENTS ΔXmax(x,y,z), ΔYmax(x,y,z), ΔZmax(x,y,z)
S11
CALCULATE 3D DIVISION WINDOWS Wx(x,y,z), Wy(x,y,z), Wz(x,y,z)
S12
ACQUIRE DIVIDING IMAGE DATA $Px_{L,M,S}(x,y,z)$, $Py_{L,M,S}(x,y)$, $Pz_{L,M,S}(x,y)$ BY WEIGHT FUNCTION
S13
ACQUIRE K-SPACE DATA $Sx_{L,M,S}(x,y,z)$, $Sy_{L,M,S}(x,y)$, $Sz_{L,M,S}(x,y)$ by FT
S14
CORRECT PHASES EVERY THREE COMPONENTS WITH RESPECT TO k-SPACE DATA, AND ACQUIRE CORRECTING DATA
S15
SYNTHESIZE CORRECTING COMPONENTS OF k-SPACE DATA
S16
CONVERSION FROM K-SPACE DATA AFTER SYNTHESIS INTO IMAGE DATA
S17

FIG. 14

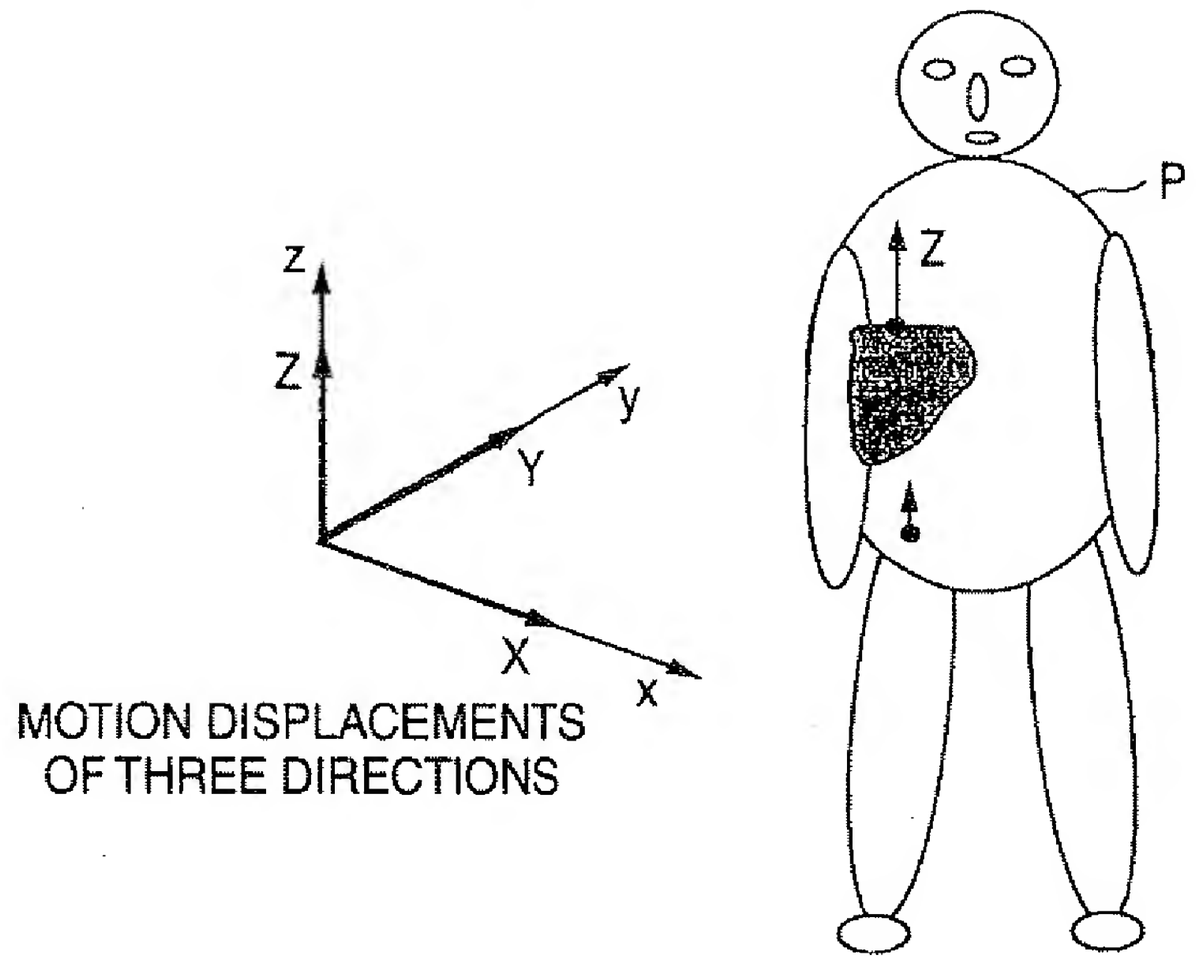



FIG. 15

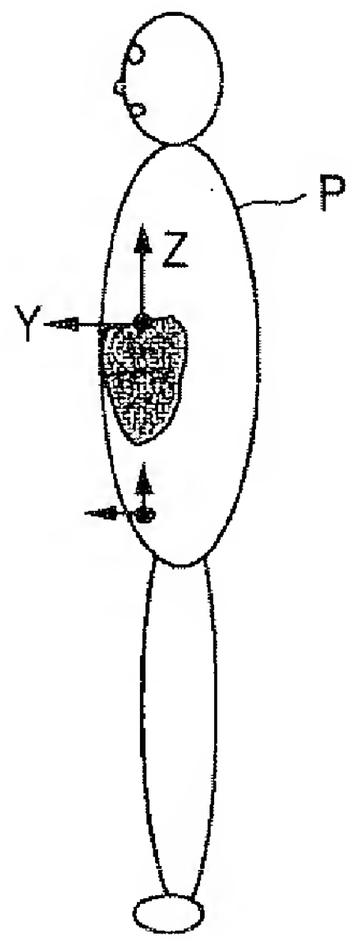


FIG. 16

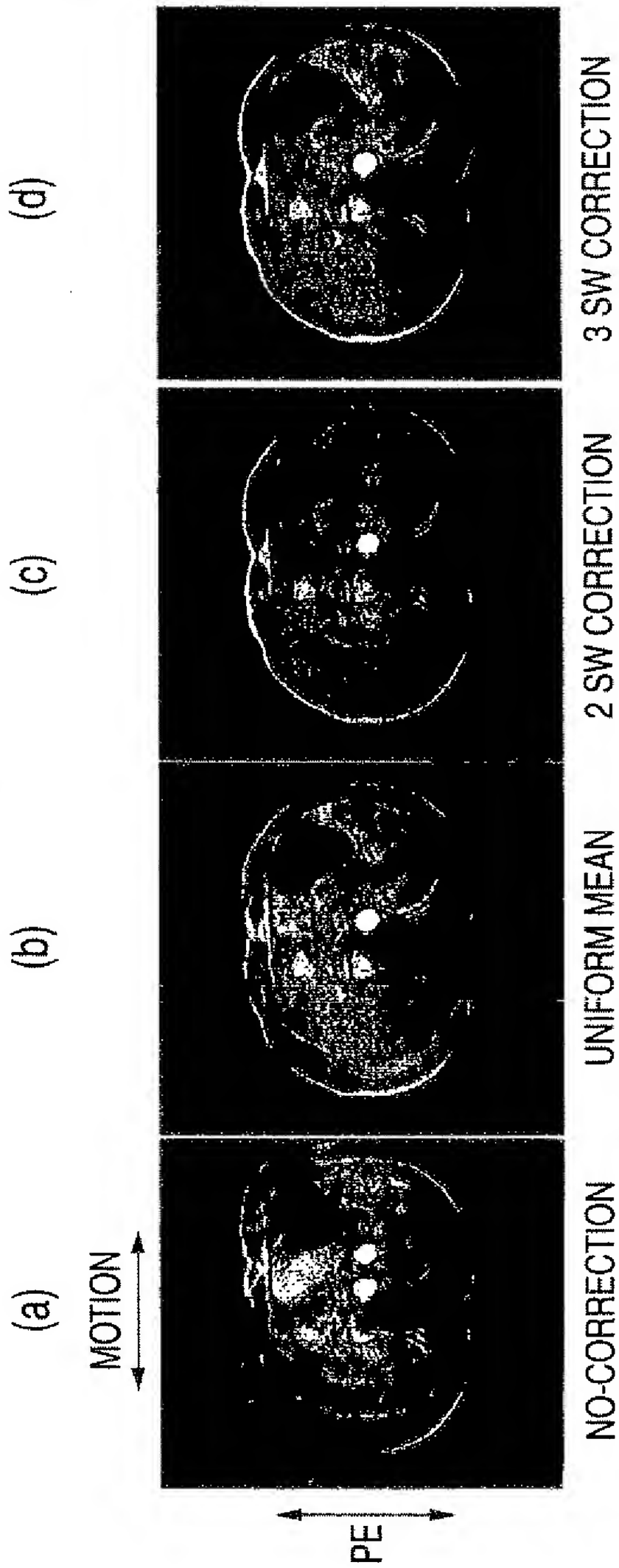

(a)
MOTION
PE
NO-CORRECTION
(b)
UNIFORM MEAN
SHIFT CORRECTION
(c)
2 SW CORRECTION
(d)
3 SW CORRECTION

FIG. 17

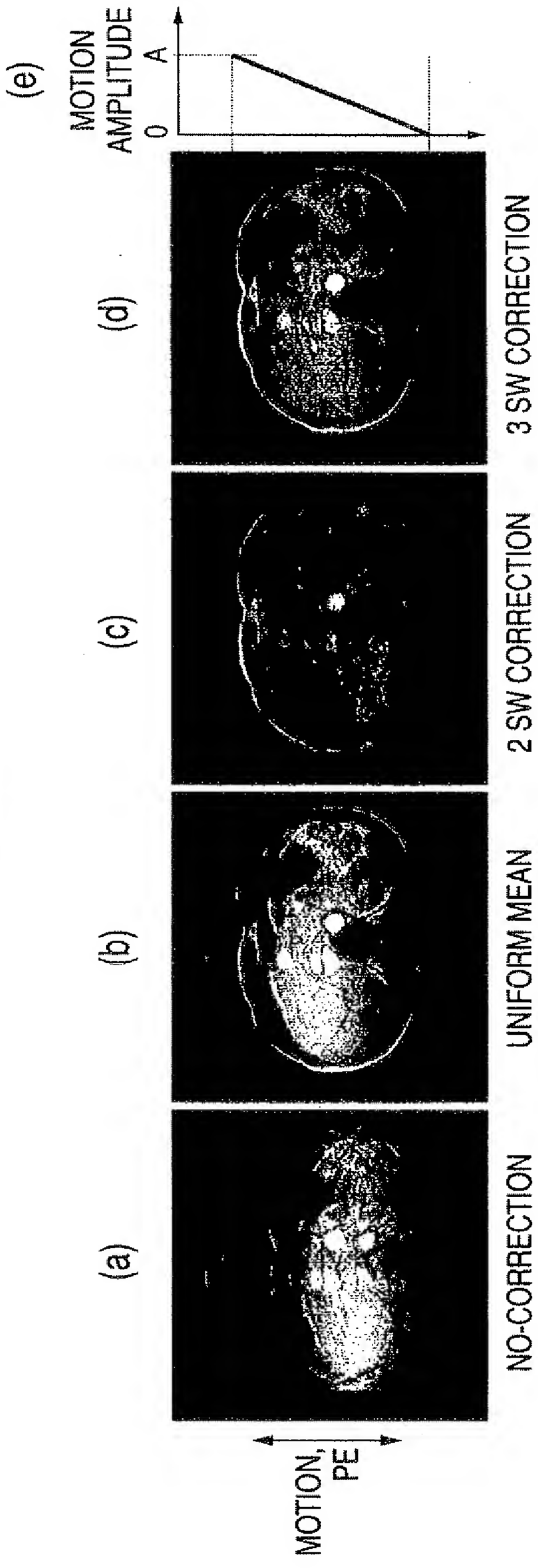

(e)
MOTION AMPLITUDE
A
0
(d)
3 SW CORRECTION
(c)
2 SW CORRECTION
(b)
UNIFORM MEAN SHIFT CORRECTION
(a)
NO-CORRECTION
MOTION, PE

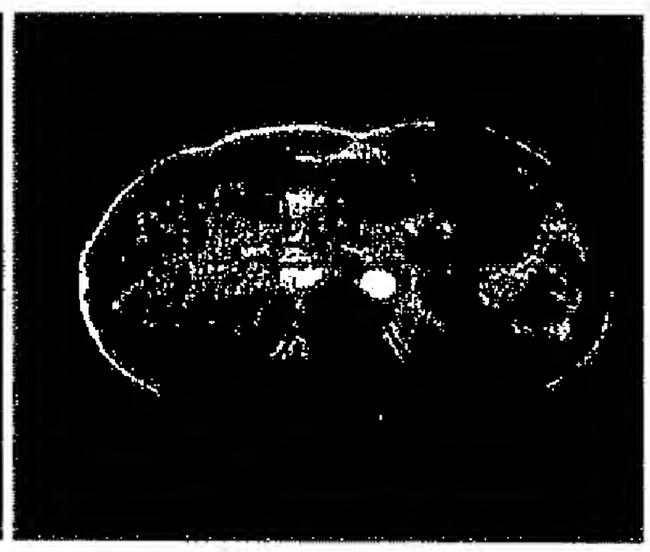
*FIG. 18*

SINGLE-COIL IMAGING

(a)

2 SW (INCLUDING AIR) CORRECTION

(b)



3 SW (INCLUDING AIR) CORRECTION

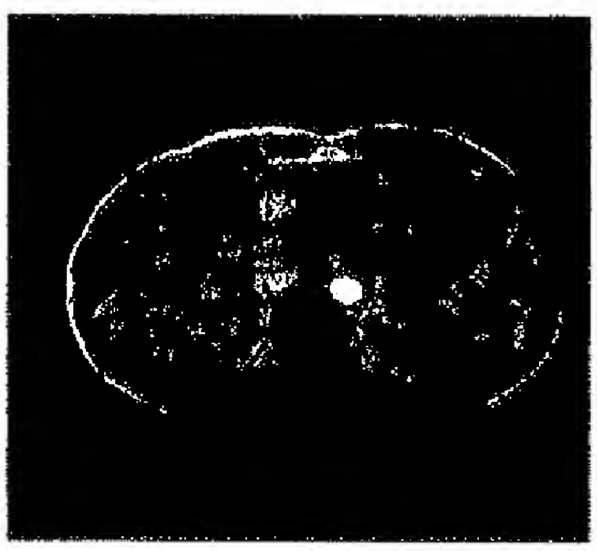
*FIG. 19*

MULTI-COIL IMAGING

(a)

NO SW CORRECTION

(b)



+2 SW CORRECTION